C76/citizens

Working for Clean Water
An Information Program for Advisory Groups

Facility Planning in the Construction Grants Program

Why is the community conducting a wastewater study?

Is there really a water quality problem?

Are the existing facilities adequate?

What unique resources should be protected?

Are the projections for future growth realistic and within community desires?

Are the full range of treatment alternatives being considered?

Which alternatives can the community afford?

Citizen Handbook

NEWARK PUBLIC LIBRARY
DEC 11 1980
U. S. GOVT. PUBS.
DEPOSITORY 376

This program was prepared by
The Pennsylvania State University
Institute of State & Regional Affairs
Middletown, PA 17057

Dr. Charles A. Cole
Project Director
Dr. E. Drannon Buskirk, Jr.
Project Co-Director
Prof. Lorna Chr. Stoltzfus
Editor

This unit was prepared by
Charles A. Cole and E. Drannon Buskirk, Jr.

Advisory Team for the Project
David Elkinton, State of West Virginia
Steve Frishman, private citizen
Michele Frome, private citizen
John Hammond, private citizen
Joan Jurancich, State of California
Richard Hetherington, EPA Region 10
Rosemary Henderson, EPA Region 6
George Hoessel, EPA Region 3
George Neiss, EPA Region 5
Ray Pfortner, EPA Region 2
Paul Pinault, EPA Region 1
Earlene Wilson, EPA Region 7
Dan Burrows, EPA Headquarters
Ben Gryctko, EPA Headquarters
Robert Hardaker, EPA Headquarters
Charles Kauffman, EPA Headquarters
Steve Maier, EPA Headquarters

EPA Project Officer
Barry H. Jordan
Office of Water Programs Operations

Acknowledgements
Typists:
Ann Kirsch, Jan Russ, Tess Startoni

Student Assistants:
Fran Costanzi, Kathy DeBatt, Michael Lapano, Mike Moulds, Terry Switzer

Illustrator:
Charles Speers

Graphics support was provided by the Office of Public Awareness, U.S. Environmental Protection Agency.

Photographs were provided by U. S. Environmental Protection Agency, USDA - Soil Conservation Service, and Penna. Department of Environmental Resources.

Facility Planning in the Construction Grants Program

Facility Planning and Construction Grants

Let's face it. A sewage plant lacks the appeal of a new park or public library. Most people have little interest in sewage until it poses a threat to the community or family. This concern may be a health problem, a public nuisance, or even higher taxes.

Construction Grants Process: A Summary

Why does a community take the steps to build or improve sewage treatment facilities? There are several possible reasons:

- Voluntary community action to develop or improve public facilities
- Voluntary action to remove a public nuisance or community problem
- Compliance with local or other public health codes
- Compliance with federal pollution control regulations or state water quality standards
- Compliance with a court order.

While local desires or public health considerations may be factors, most communities have to deal with sewage treatment for two reasons: The Federal Clean Water Act of 1977, and State Water Quality Standards.

Through the Clean Water Act, Congress and the President have established a national goal of waters suitable for fishing and swimming. The Act requires at least secondary treatment for all publicly-owned sewage systems (Secondary treatment generally removes 85 percent of BOD and suspended solids). BOD, called biochemical oxygen demand, and suspended solids are measures of pollution strength. Enforcement of these regulations is ensured through the National Pollution Discharge Elimination System (NPDES) that requires permits for all wastewater discharges.

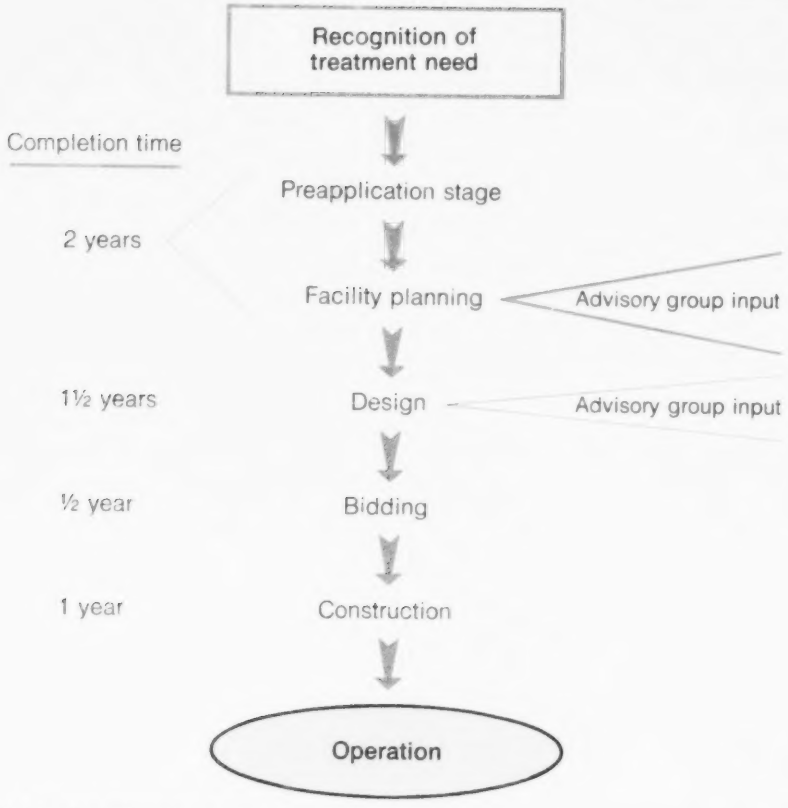
States determine how much pollution can enter a water body by establishing water quality standards. These standards are based on the potential uses of the water body. In order to meet and maintain these standards, limitations are placed on industrial and municipal discharges. These limitations often determine the type of treatment facilities which must be built and the level of treatment which must be achieved.

The events or conditions which cause a community to look at its wastewater problems go a long way toward determining the outcome. For this reason, the advisory group should understand from the outset why the community is developing a wastewater facility plan.

The Grants Process

No matter what initiates the planning, most communities want a federal grant to help pay for new or upgraded treatment facilities. These grants are available through the Construction Grants Program.

Three main governmental bodies are involved in the construction grants process. They are the local agency, the state agency, and the United States Environmental Protection Agency (EPA).



The facility planning process takes two to ten years. The average is about five years.

How does a community get a grant? First comes the *preapplication stage*. The municipality seeks to have its project placed on the state "priority list," which is a statewide ranking of proposed projects in order of their importance. In ranking the projects the state follows an approved procedure involving several factors, including:

- Severity of the pollution problems
- Number of people affected
- Need to preserve high-quality water bodies
- National priorities
- Availability of federal grants and local funds.

If the state agency determines that the project deserves high priority and the EPA approves, the community becomes eligible for federal funding. The next job for most municipalities is to select a qualified engineering-planning consultant, if one is not already involved.

Choosing a qualified consultant is a crucial decision since the firm will conduct most of the planning. In addition to technical competence, the consultant should be able to demonstrate flexibility, and show sensitivity for local concerns.

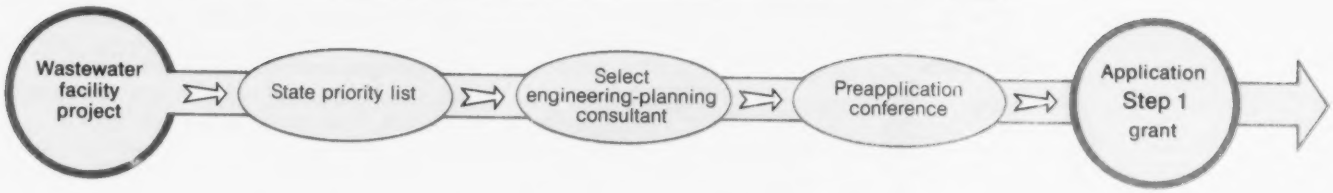
The municipality and consultant meet informally with state and EPA officials in a preapplication conference to review requirements for submitting a grant application. The municipality and consultant then prepare a plan of study describing the nature of pollution problems, the study tasks, and costs for conducting this work. The community next submits a plan of study along with an application for a Step 1 planning grant to the state and the EPA. The application contains several items, including:

- An explanation of how the community will finance the local share of the project cost
- Name of an authorized representative to act on behalf of the municipality.

The state and EPA both review the plan of study and the application. Upon approval, the EPA awards a Step 1 grant, which covers 75 percent of the planning cost. The town now enters the *facility planning stage* and becomes a *grantee*.

Planning Stage

Good planning of wastewater treatment facilities means more than just technical expertise. It means taking into account community characteristics, social values, and environmental concerns. People must work together to incorporate these from the beginning.



The facility plan is an actual document that is submitted to the EPA. Its objective is to develop a cost-effective solution to the pollution control problem. It must balance the desired degree of pollution control against economic, social, and environmental costs. The facility plan has to provide answers to many questions. Some of the more important ones are:

- Does the facility plan accurately define and verify the extent of the problem?
- How does the project fit into the water quality management plans for the region or area (i.e., 208 planning)?
- *Does the project call for a reasonable sewage collecting and treatment reserve, or is there an excess capacity?*
- How will the reserve capacity affect community growth?
- What are the project's impacts on the environment?
- What is the plan for mitigating adverse environmental impacts?
- Is the project cost-effective? That is, will it achieve the needed degree of pollution control at the least cost in money and adverse environmental effects?
- How will the project be financed? What will be the financial impact on the community and individual households?
- What are the plans for efficient operation and management of the system?

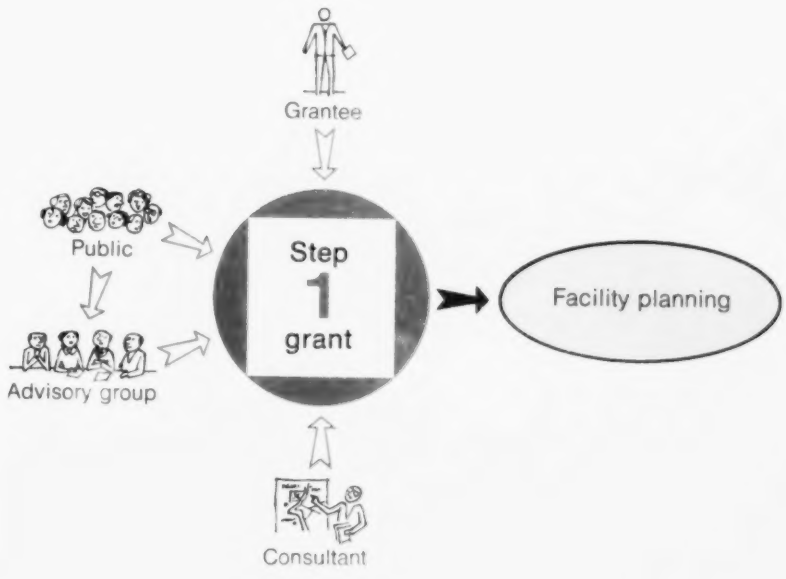
Public Participation

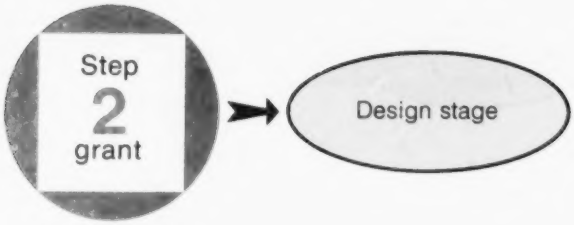
Public involvement early in the project, especially in the planning stage, is the best way of dealing with these questions, and, ultimately, gaining public support for financing any new or rehabilitated facilities.

Public participation makes good sense for many reasons:

- Incorporating public values
- Resulting in better facility plans
- Ensuring reasonable costs
- Bringing added community benefits
- Resolving controversies
- Gathering public support.

Specific public participation requirements for facility planning are covered later in this handbook.

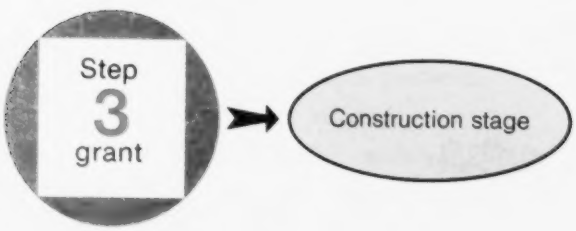




Design Stage

When the facility plan is completed it is sent to the state for approval. It is then submitted to the EPA for a Step 2 grant for *design of the facility*. The EPA reviews the facility plan to determine, among other things, whether significant adverse environmental impacts will result from the project. If the EPA determines that such impacts exist, the National Environmental Policy Act of 1969 must be prepared. If no significant impacts will result, the EPA will approve the facility plan. A Step 2 design grant is then awarded.

When the Step 2 grant is awarded the consultant prepares detailed engineering plans and specifications. The community also has several tasks. It must establish user charges — a system of fees to pay for the operation and management costs of the facility. It must prepare plans for the operation of the facility, including, if necessary, industrial pretreatment of wastewater. When these plans are complete the grantee submits them to the state and the EPA for review.



Construction Stage

If the designs and specifications receive state and EPA approval, the grantee now enters the *construction stage*. A Step 3 federal grant will often pay 75 percent of the eligible construction costs of the project (85 percent if the project qualifies as an innovative or alternative approach). States provide additional grant assistance for planning, design, and construction. The community then advertises for bids for the construction work in accordance with local ordinances, state laws, and EPA regulations. If the successful bidder's qualifications meet EPA requirements, the contract is awarded.

The construction begins on the facility. While construction continues a manual for the operation and management of the facility is prepared. When construction is completed the state and the EPA conduct final inspections. *The EPA then makes a final audit, and pays only its share of the eligible costs.*

Finally comes the operation and management of the facility. This is possibly the most difficult part of the project and is often overlooked. Every measure should be taken to be sure that the community can live with whatever facilities are built. Once the construction is completed, grant assistance ends. The community must pay 100 percent of all operation and management costs.
These three stages — from the beginning of Step 1 to the end of construction — can require seven years or more. Facility planning alone takes 17 to 36 months. It all depends upon the size and complexity of the project.

Advisory groups should watch that planning proceeds with a minimum of delays. In these inflationary times this is crucial.

Facility Planning and the Advisory Group

The community must seek adequate public involvement throughout the facility planning process.

Public Participation Program

All Step 1 (facility planning) projects must meet certain basic requirements for public involvement. However, small projects involving minor sewer rehabilitation or minor upgrading are exempt from most public participation requirements. Where public participation is necessary, the grantee:

- Develops a public information program in the early phases of decision making
- Has a program for consulting the public throughout the facilities planning process, including the selection of the engineering consultant if feasible
- Includes an outline of the public participation program in the plan of study accompanying the Step 1 grant. A more extensive public participation work plan must be submitted no later than 45 days after the Step 1 award
- Distributes the work plan and fact sheets to interested groups and individuals
- Consults with the public when assessment of current and future situations and alternatives are being evaluated
- Holds a public meeting when the cost effectiveness of the alternatives is determined, but before any plan is selected
- Holds a public hearing to discuss the recommended alternatives prior to adoption of a facility plan
- Includes an evaluation of the effectiveness of the public participation program in the facility plan.

Complex, controversial, or significant projects justify more intensive public involvement. The EPA Regional Administrator orders a full-scale public participation program when the project warrants an environmental impact statement, advanced waste treatment is involved, or the Administrator determines that more active public participation is needed.

In addition to meeting the requirements of the basic public participation program, a grantee with a *full-scale* program:

- Hires or designates a coordinator to carry out the public participation workplan
- Holds a public meeting (instead of general consultations) early in the facility planning process at the time when current and future situations are being identified, and initial alternatives are being screened
- Establishes an advisory group shortly after acceptance of the Step 1 grant award.

Planning Steps

The facility planning process has several planning steps. On the surface these steps may appear sequential, but, in fact, they are intertwined. Decisions must be constantly reevaluated as new information becomes available.

The major steps are:

1. Assessing the current situation
2. Assessing the future situation
3. Identifying alternatives
4. Conducting environmental assessment
5. Making cost-effectiveness analysis
6. Selecting the plan.

The advisory group should play an important role in the public participation program, which continues through all of these steps.

Many aspects of the community's future must be considered during the planning process.

Assessing the Current Situation

Public involvement is crucial in the first step. Information overlooked or misinterpreted may substantially affect the outcome of the facilities planning process. The severity and extent of existing problems should be verified.

During this stage the agency gathers information on the planning area: institutions, population, and environmental aspects such as water quality. Data also is needed on existing wastewater flows, treatment systems, and the performances of these treatment systems. One special concern is environmental consequences of infiltration and inflow (I/I). Infiltration and inflow are surface and groundwaters that get into the sewer systems. Is it cheaper (more cost-effective) to provide treatment capacity to compensate for excessive I/I, or is it better to repair the sewer system?

Advisory groups should watch carefully the assessment of the current situation. They will want to be sure that the data is accurate, that data collection methods are thorough, and that operation and management of existing facilities are adequate. Before going any further, the community should know what the problems are and what is causing them.

Advisory Group Questions:
Current Situation

- **Do water quality problems really exist?**
- **What are they?**
- **Are the existing facilities sufficient?**
- **Is the soil adequate for onsite disposal?**
- **What unique resources does the community have that are worth protecting?**
- **How does the areawide 208 plan relate to the facilities plan?**

Assessing the Future Situation

Assessment of the future situation is often the most difficult part of facility planning, and probably has the most impact on the planning process. The advisory group is made up of a cross section of residents who know the community. For this reason the advisory group can play an important role in discussing the community's future. Projections about the future are uncertain, and even the experts admit that some guess work is involved. This important step in facility planning can benefit from the experience and knowledge of advisory group members.

A whole series of issues must be addressed:

- How is the future population estimated?
- How much wastewater will the population generate?
- What is the basis for estimating the total wastewater flow?
- How does the facility relate to other community objectives such as recreational opportunities?
- How does industry affect the size of the facility?
- Is it better to seek reduced flows through water conservation, or to build reserve capacity for growth?
- What geographic areas will the facility serve?
- What are the projected land uses?

Each of these issues has a major impact on the facility. They warrant more detailed analysis and advisory group discussion.

Population Estimates

Sewage collection and treatment facilities can turn bullish population forecasts into self-fulfilling prophesies. Many communities have nearly gone bankrupt because of oversized and underused wastewater treatment plants. Such facilities create economic pressures to spread around the cost by adding more users. In addition to unwanted growth, in the early years the users essentially pay the tab for nonexistent population. To avoid paying for more wastewater treatment capacity than is actually needed, the advisory group should be sure that reasonable projections are made.

Assumptions or calculations should not be accepted without careful consideration and discussion.

The EPA gives special attention to this important issue. Guidelines to the cost-effectiveness analysis regulations give the procedures for using population projections in both 208 areawide and 201 facilities planning.

Wastewater Generation

The future need for sewage treatment capacity is determined by multiplying the total population times the estimated wastewater volume per person. The large populations can magnify small errors in per capita estimates. Recent studies show per capita sewage flows in the range of 50-80 gallons per day (gpcd). The common estimate of 100 gpcd includes flows due to infiltration and inflow, and small amounts from commercial establishments. The advisory group should ask for verification of the flows.

Industrial Contribution

Joint treatment of industrial and domestic wastes produces economies of scale and sometimes improved operations. However, these wastewater mixtures can make biological sewage treatment processes less effective. They also can contain substances that cause problems in sewers, sludges, or land treatment systems.

Since industrial wastes may upset (damage) wastewater treatment plants, the EPA has issued general standards for the pretreatment of these wastes. The EPA requires each federally-assisted agency to adopt industrial waste ordinances, equitable user charges, and industrial cost recovery systems.

Industrial waste flows should be assessed to ensure that the treatment capacity reserved for industry is adequate but not excessive.

Water Conservation

The EPA requires the community to consider wastewater flow reductions in studying various planning alternatives. As a minimum the grantee must assess:

- Flow reduction methods for existing residential, commercial, and industrial sources
- Future flow reductions achieved through changes in local ordinances, codes, price strategies, and public information programs.

Sewer Service Area

The service area is determined by the community with the advice of the engineering consultant. Regional plants have been favored in past years since they appear to offer ease in regulation, monitoring, and economies of scale for treatment. However, considering that 70 percent of the money for wastewater pollution control is spent on the collection and transport of wastes, moving sewage from one spot to another may not be cost effective!

Small-scale treatment alternatives, including individual septic systems, are regaining prominence in water quality planning. *The issue of sewer pipe size and service area thus is extremely important.*

Sewer Issue

Advisory groups should be interested in sewers because sewers:

- Cost 70 percent of water pollution control expenditures
- Are usually not fundable with federal monies, but can cost more than $50 per foot!
- Affect future land uses and land values
- Spur development into areas
- Affect future growth of the community.

There are three basic types of sewers: Interceptor sewers, collector sewers, and lateral sewers. The interceptor sewers are large pipes that gather wastes from neighborhoods and communities. Their location can determine where new neighborhoods are built, where industry will locate, and where new commercial development will occur. Without careful planning, interceptors can lead to unwanted development and suburban sprawl. Interceptor sewers are eligible for 75 percent federal grants.
The potential for unwanted growth associated with an interceptor sewer was so great in the Gettysburg, Pennsylvania, facility plan that the EPA ordered work stopped and an environmental impact statement prepared.

Collector sewers pick up sewage from within the neighborhood itself. Collector sewers for new communities generally are not fundable. Lateral sewers, the hookups from the homes to the collectors, are not eligible for federal grants.

The funding policies of the EPA and states, however, are often complex and confusing. Advisory groups should be aware of those which relate to the particular situation and identify the portion of the collection system that will have to be paid for with 100 percent local funds.

Advisory Group Questions:
Future Situation

- **How much growth is projected?**
- **Are projections consistent with community goals and land use plans?**
- **What per capita flow projections are being used?**
- **Are wastewater flow projections accurate?**
- **Where will interceptor sewers be located?**
- **What parts of the community will be served by sewers?**

Most costs of a sewer system arise from acquiring rights of way, laying pipes, and building pumping stations. It costs little more to install a large diameter sewer than a small one. There is a strong temptation to build reserve or growth capacity into the system. Growth capacity and location of sewers thus are of enormous importance to many communities. The advisory group can see that the issues are fully evaluated and discussed.

Total Flow Estimates

Daily average wastewater flow is often used for the design of treatment works. It is based on expected future population, per capita waste contributions, industrial flows, commercial flows, reasonable infiltration and inflow estimates, and the impacts of water conservation. From a technical perspective it is easy to design a plant after the design flow is chosen.

Unfortunately, much more effort often goes into the design of processes rather than the more important matter of design flow predictions. The advisory group should see that this does not occur. An advisory group should place considerable emphasis on the design flow estimate!

Identifying Alternatives

There are many ways to collect and treat wastewater. However, given all the limitations of water quality standards, regional service area, and cost effectiveness, the community may find that only a few alternatives exist.

As the number of options diminishes, the selection of the treatment processes becomes more a matter of an engineering and economics choice. This is why the early work in identifying the problem and assessing the current and future situations becomes so important to the advisory group. Nevertheless, the advisors can still emphasize processes that appear the most economically and environmentally sound.

Some of the basic options include:

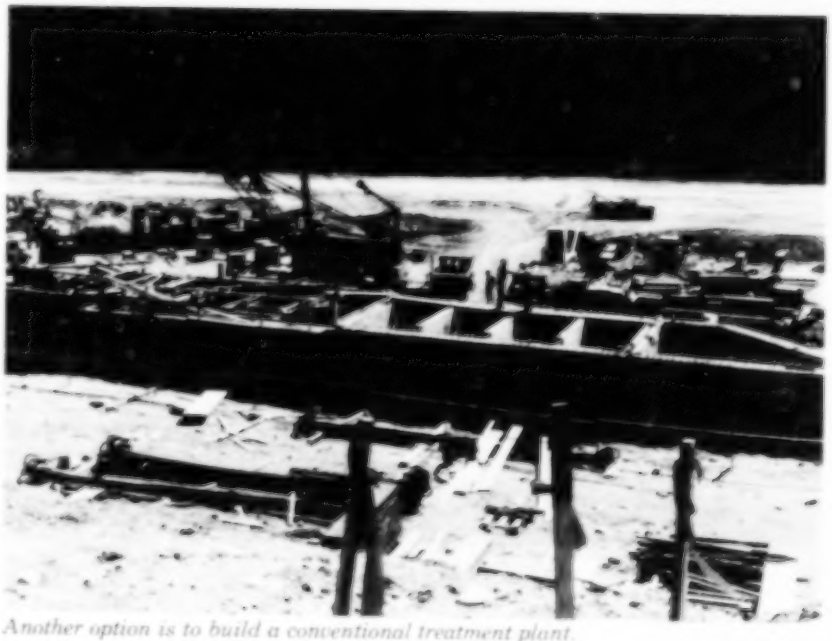
• *No Facility*
Are new or upgraded facilities really required? This basic question should be answered before any other options are pursued. The performance of existing facilities may possibly be improved as an alternative to constructing new facilities. Recycling or pretreatment may reduce industrial waste loads. Water conservation may reduce residential flows. Other considerations exist.

• *Conventional Wastewater Treatment Alternatives*
Conventional wastewater treatment systems deliver wastewater to a central treatment facility, subject the wastewater to a series of treatment processes, and discharge the effluent into surface waters. If operated properly, conventional technologies can produce effluents of high quality, although sometimes at high cost. These processes are usually time-proven and dependable.

• *Advanced Wastewater Treatment Options*
Do water quality problems really require advanced wastewater treatment? Advanced wastewater treatment methods may double the cost of treatment as compared to secondary methods. With land application as a notable exception, they often consume large amounts of energy and chemicals, and produce excessive volumes of waste by-products called sludges.

• *Waste Treatment and Reuse of Purified Water*
Water resources are becoming increasingly more limited and/or expensive to develop. As the cost goes up, the reuse of treated wastewater becomes more attractive. Reuse currently occurs as industrial cooling or process waters, recreational water supplies, and agricultural irrigation. *In Lubbock, Texas, where irrigation water is scarce, 15 mgd of secondary effluent is applied to 2,300 acres of wheat, barley, oats, rye, cotton, and sorghum. An aquifer created by the effluent over the decades is now used to supply recreational lakes.*

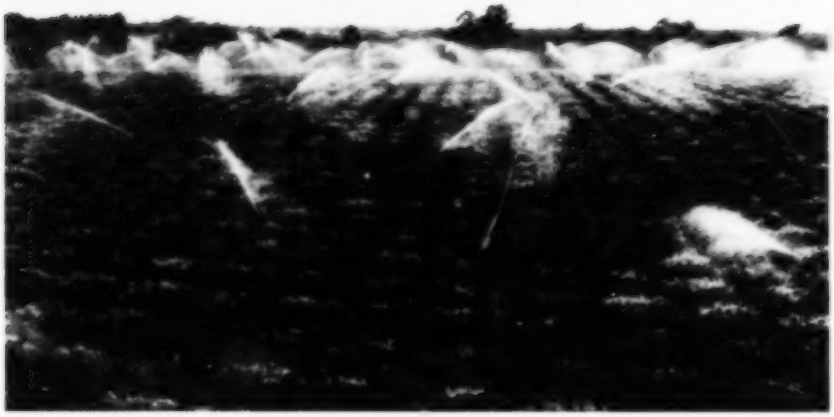
One option is not to build a facility.


Another option is to build a conventional treatment plant.

Advisory Group Questions:
Alternatives

- **Is a full range of alternatives considered, including small-scale options as well as the central treatment facilities?**
- **Is land treatment seriously considered?**
- **Is operation and management taken into account?**
- **Is sludge handling and disposal accounted for?**
- **Are there opportunities to recycle or reuse treated wastewater?**
- **How much treatment capacity is required?**
- **Are innovative and alternative technologies considered?**
- **Is the plan compatible with the 208 areawide plan?**

Construction of onsite treatment systems is also an option.



Another option is land application.

Better operation and management of the existing facility is an option.

• *Small System Waste Treatment and Disposal*
Onsite treatment systems to collect and control wastewaters include septic tanks, mounds, holding tanks, small aerobic treatment plants, or other onsite and small processes serving residences or commercial establishments. The onsite alternative is becoming increasingly attractive since the Clean Water Act provides federal grant funds for onsite treatment works in certain situations.

• *Conventional Treatment and Land Application*
Wastewater is processed in the conventional manner at the primary or secondary treatment level. However, the effluent is applied to the land, not discharged into surface waters. Federal law requires the specific consideration of land application as an alternative. Land treatment is a good consideration for advanced waste treatment. Some states require secondary treatment before application, which placed land treatment at a severe economic disadvantage to conventional methods except for advanced waste treatment requirements.
In Muskegon County, Michigan, 6,300 acres planted mostly with corn are irrigated by secondary effluent from a 43 million gallons per day (mgd) wastewater project.

• *Sludge Management*
Sludge management and disposal is a major problem! Unfortunately, the pollutants removed from wastewater do not vanish. They become an obnoxious material called sludge. The cost of sludge treatment often equals the cost of sewage treatment. It, therefore, is a vital part of the analysis of every treatment system. Advanced wastewater treatment sludges add to the problem. Some land treatment procedures do not produce sludge.

• *Operation and Management*
Operation and management is a major concern of both existing and new treatment facilities. The EPA has found that many facilities do not meet water quality limits because they are not operated properly. Operation and management are extremely important in facility planning. These costs must be borne solely by the locality.

• *Other Considerations*
The EPA guidelines also call for a few other considerations in the selection of alternatives. Matters such as construction staging schedules, and multiple use opportunities for open space and recreation are taken into account.

Conducting Environmental Assessment

Environmental aspects of different sewage management alternatives are assessed during the facility planning. Both the primary and secondary impacts associated with various alternatives are addressed.

The primary effects are those that directly relate to location, construction, and operation of the project. For example, impacts on a stream from the effluent are direct effects. Secondary effects are indirect or induced by the project, such as changes in population, economic growth, and land use.

A grantee has to prepare an environmental information document, which is used in the facility planning, and is submitted to the EPA. The EPA then reviews it to determine whether or not to prepare a full environmental impact statement (EIS). An EIS must be prepared if:

- The facility plan will induce significant development and changes in land use
- The treatment works is located on productive wetlands or will affect endangered species
- The treatment works will have a significant adverse effect on public lands, and recreational or historic opportunities
- The treatment works will have a significant adverse effect on air or water quality, noise, and/or on fish and wildlife habitats
- The effluent limitations for pretreatment are insufficient to protect present or future water uses
- The treatment works will cause significant social dislocations, or will adversely affect significant amounts of agricultural land.

To save time EIS's are often conducted concurrently with facility planning. EIS's are prepared for only about five percent of the construction grant projects.

The advisory group can help identify potential impacts at the local level. It should see that the environmental information has adequate public and governmental review. The federal requirements are quite specific and should be consulted.

Advisory Group Questions:
Environmental Effects

- **What are the existing and future environments without the project?**
- **Has an environmental, social, and economic evaluation of waste treatment alternatives been made?**
- **Have all environmental impacts been identified and thoroughly discussed?**

Making Cost-Effectiveness Analysis

The final selection of the wastewater treatment alternative is based upon a cost-effectiveness analysis. It is a method of determining how well a treatment system achieves its objectives in terms of overall costs, including economic, social, and environmental costs. This may not sound very interesting, but it is important. Except for certain innovative and alternative projects, the EPA can only fund the most cost-effective solution. The most cost-effective wastewater management solution is the one with the lowest overall monetary costs (including capital, operation, management, mitigation, and opportunity costs over a 20-year period) without significant adverse nonmonetary effects such as environmental or social drawbacks.

Capital costs are eligible for federal grants, but operation and management costs are borne completely by the municipality. The costs of mitigating adverse environmental effects, and the costs associated with opportunities lost because of the project, are also figured into the analysis. Besides costs there are offsetting revenues. For example, the revenues from the sale of wastewater or organic sludge to farmers, or the value of crops grown on public land with land application of the wastewater go into the calculations.

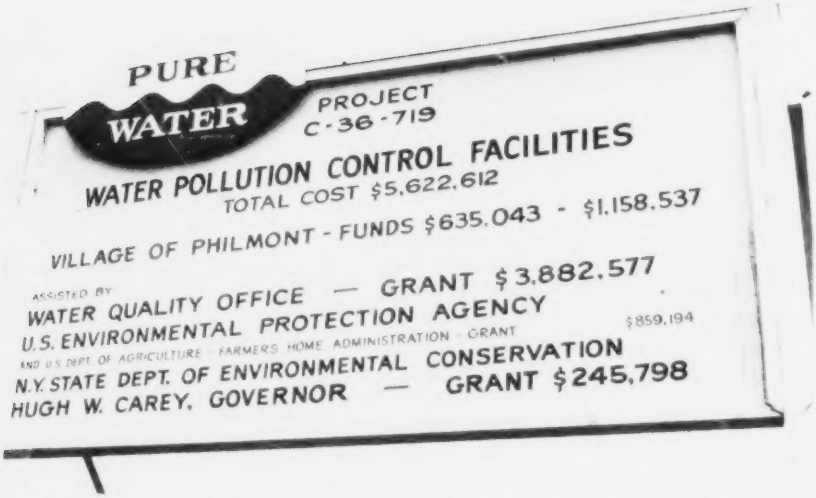
Another area of costs is important to localities, but do not enter the cost-effectiveness analysis. This matter — finance — concerns how the community will pay for its share for planning, design, and construction costs. It is not a subject that is ignored until the end of the process. Indeed, the means of local finance such as taxes, and user fees must be fully discussed in the facilities plan.

The advisory group is not expected to perform detailed cost calculations. Nevertheless, it can probe the costs and offsetting revenues that go into the bottom line dollar value. Even more important, however, is the review for overriding environmental and social considerations. The advisory group also should see that the full meaning of the local financial arrangements, such as household charges, are realized by the community.

Advisory Group Questions: Cost Effectiveness

Which sewage treatment alternative has the least monetary cost without overriding environmental and social drawbacks?

Are the environmental and social effects adequately assessed?


PURE
WATER
PROJECT
C-36-719
WATER POLLUTION CONTROL FACILITIES
TOTAL COST $5,622,612
VILLAGE OF PHILMONT - FUNDS $635,043 - $1,158,537
ASSISTED BY
WATER QUALITY OFFICE — GRANT $3,882,577
U.S. ENVIRONMENTAL PROTECTION AGENCY
AND U.S. DEPT. OF AGRICULTURE - FARMERS HOME ADMINISTRATION - GRANT $859,194
N.Y. STATE DEPT. OF ENVIRONMENTAL CONSERVATION
HUGH W. CAREY, GOVERNOR — GRANT $245,798

Sign showing cost of water pollution control facilities for Philmont, NY.

Selecting the Plan

All the activity in facility planning culminates in the selection of a preferred alternative. Before the final choice is made the number of alternatives has already been reduced. This initial screening eliminates certain options from further analysis.

The advisory group should be sure at every stage that there are valid reasons for dropping alternatives. The ramifications and tradeoffs of all alternatives should be evident.

The local agency (the grantee) is responsible for making the final decision. The basis for this decision is the sum total of facility planning.

This includes the technical work of the consultant and the advice of the advisory group and other residents of the community. Some final questions for the advisory group are:

- Does the final choice meet the initial goals and objectives?
- Will it solve the community's problem for the least cost and with the least adverse effects?

Summary

An important point to remember is that facility planning accounts for only five percent of the construction grant dollars spent. However, this small amount directs how the remaining 95 percent will be spent in design and construction. The need for goal planning and the consequences of inadequate planning should be evident.

The advisory group can incorporate the values and ideas of community residents into the facility planning process, thereby ensuring a better final solution at reasonable costs to the community.

Case Study

Choosing the Alternative

Southeastern United States

This case study is adapted from: Rastatter, C.L., ed. Municipal Wastewater Management: Citizen's Guide to Facility Planning. *FRD-6, Washington, DC: U.S. Environmental Protection Agency, Office of Water Program Operations, January 1979, 263 pp.*

This is the actual case of a small town in the Southeast that has no public management of wastewater. The circumstances and facts about the town's facility plan show how treatment alternatives are evaluated.

The town's population is 3,150. A water district provides water service to 436 people through 170 water meters, of which 150 are located in the town itself. The district includes 19 small businesses, one factory, and an elementary school. The district desires to provide sewerage service. It has prepared a 20-year wastewater facilities plan, and has applied to the EPA for grant assistance.

The planning area is about 2,300 acres. Overflowing septic tank systems are the only source of wastewater discharges. There are no known point sources of wastewater effluent. About 20 percent of the homes are located on soils with very low permeability, which probably accounts for the occasional failures of the septic tanks.

The area's population is relatively stable. The district currently has a moderate growth rate, adding about four customers a year. The factory, however, plans to expand. Population is expected to grow by 50 to 100 percent in the next 20 years.

The district sees a public wastewater system as a key ingredient for future growth and improvements, and as a remedy for the current health hazards and environmental pollution.

Some wastewater management alternatives were initially rejected. Upgrading existing facilities — more than 130 septic tanks and pit privies, inadequately designed and poorly maintained — was considered impracticable, because the impermeable soils were unsuitable for onsite disposal systems.

Regional solutions were much too costly. The nearest existing treatment facility is 17 miles away. The capital costs of sewers, force mains, and pumping stations to deliver the district's small flow to the regional plant would exceed $1 million, nine times the cost of any local alternative.

Monetary Evaluation

The district analyzed the complete spectrum of waste treatment alternatives. Four were evaluated in detail. Monetary costs were determined for them:

- **Alternative No. 1.** A conventional gravity sewer system with a central treatment facility. The least expensive type of treatment would be an oxidation lagoon, followed by an infiltration-percolation land treatment system. Another option — aerated reactor tanks followed by soil infiltration-percolation — was rejected as slightly more expensive

- **Alternative No. 2.** Similar treatment process, but most of the sewer system would employ effluent sewers. In this approach wastewater solids are removed by septic tanks and stored near each source. Only the liquid effluent from the septic tanks is pumped to the central treatment site. The effluent sewer system consists of interceptor tanks and siphons or heavy duty sump pumps, with small diameter plastic pipes carrying the effluent to a central oxidation pond for additional treatment

- **Alternative No. 3.** This alternative would involve the use of short stretches of effluent sewer (similar to sewers in Alternative No. 2), but the septic tank effluent would be carried directly to a subsurface disposal site. The effluent would be disposed in 22 separate community sites. New individual disposal systems also would be provided for an additional 22 customers. All onsite and offsite wastewater facilities would be publicly-owned and managed, including septic tanks, sewers, and treatment disposal facilities. Services to the elementary school and to the factory would be an option that would not affect the relative costs of the four alternatives, but could reduce the average charges per customer. Even without the school and industry sharing the costs, the user costs for this alternative would be significantly lower than for the other two options. User costs were estimated to be just 58 percent of those required for Alternative No. 2, while construction costs were about 21 percent lower than Alternative No. 2, and 42 percent lower than Alternative No. 1.

- **Alternative No. 4.** This approach would consist of onsite disposal for all of the 144 customers included in Alternative No. 3. Serious problems of design and implementation caused this alternate to be rejected.

Monetary Costs of Four Alternatives

Item	Alternative 1	2	3	4
Sewers	$390,100	$246,900		
Treatment	81,600	81,600		
Disposal	53,900	53,900		
Total	$525,600	$382,400	$302,700	$268,300

By avoiding the costs of sewer construction and maintenance, Alternative No. 4 would have the lowest capital and operating costs. However, about 20 percent of the existing structures are located on soils that severely limit onsite disposal.

The next least costly option would be Alternative No. 3, the community subsurface disposal system. It would be 11 percent more expensive than No. 4. However, the cost estimates of Alternative No. 3 probably would be more accurate since there were fewer uncertainties in construction and operation.

Nonmonetary Evaluation

All four alternatives would meet the effluent criteria, and satisfy other environmental criteria. In the actual facilities plan the environmental effects were qualitatively evaluated in detail, and then rated with numbers from 1 (best) to 4 (worst).

Alternative Nos. 1 and 2 would have larger erosion losses because of the construction of conventional gravity sewer systems, lagoons, and an infiltration basin. Alternative No. 2 would have less erosion and disturb streams less than No. 1 because small diameter pressure sewers are not buried as deep as conventional gravity sewers. These alternatives also would produce significantly more noise because of sewer construction.

As for developmental effects, conventional gravity sewers could stimulate slightly more growth and new industry where excess sewerage capacity exists. Thus, Alternative No. 1 would have greater potential for secondary impacts than options Nos. 2, 3, and 4. However, this is a rural community, and other factors such as labor supply and transportation influence growth as much as sewer services affect growth. Thus, all alternatives would have only slight secondary impacts.

Implementation

All alternatives could be implemented legally by the water district. Alternative Nos. 3 and 4 are less common techniques. Therefore, they could require additional time for local, state, and federal approvals. However, since Alternatives Nos. 1 and 2 may require trained operators, and require more local funds, potential users may object to the user charges.

Since the water district would operate wastewater services, and it is an organization known to and generally supported by local users, it probably would satisfactorily implement construction, operation, maintenance, and financial management. The fourth alternative would be particularly difficult to implement since 20 percent of the homes are located on soils with low permeability. Generally, none of the alternatives has any overwhelming advantage for implementation.

Cost-Effectiveness Analysis

Monetary costs, environmental effects, implementation feasibility, and other factors are considered together in a cost-effectiveness analysis. Alternative No. 2 was considered better than No. 1. The second alternative removes 70 percent of the suspended solids and 50 percent of BOD in the interceptor tanks, reduces the organic load in the sewer, and reduces the environmental effects of accidental discharges from the sewer system. Alternative No. 3 was considered ecologically sound since accidental sewer discharges are minimized, and nutrients are returned to the land.

Alternatives Nos. 3 and 4 also avoid the need to upgrade treatment facilities to meet changing standards for effluent discharges to surface waters. Alternative No. 3 minimizes system complexity and reduces O&M costs. Alternatives Nos. 3 and 4 also permit planning of community expansion since strip growth could be encouraged by conventional sewers. Alternatives Nos. 3 and 4 would not produce odors, while odors may occur from a treatment facility.

In general, the environmental effects did not differ greatly for the four alternatives, partly because of the small size of the project, the lack of sensitive environmental features, and the relatively slow rate of growth.

Plan Selection

Public hearings were held on the alternatives after the costs and effects of each were predicted. Generally, Alternative No. 3 was preferred due to lower total cost and simplicity of operation. The cost of community wastewater management was thought to be about equal to the cost of privately maintaining and replacing existing septic tank systems — about $7 per month for an average user charge. By contrast, the conventional sewers and central treatment were expected to cost $15 per month.

Alternative No. 3 was selected by the community and funded by the EPA.

Need More Information?

Deese, P. L. and J. F. Hudson. *Planning Wastewater Management Facilities for Small Communities*. Draft. Cincinnati, OH: Municipal Environmental Research Lab., Office of Research and Development, U.S. Environmental Protection Agency, July 1979. 141 pp.

This manual presents a set of procedures for planning wastewater management for small communities and is directed at areas with populations less than 10,000 persons. Part 1 gives an overview of the planning process and is most useful for the advisory group. Part 2 is a technical reference showing details using case studies. This manual can be obtained from: ORD Publications Center for Environmental Research Information U.S. EPA, 26 West St. Clair Street, Cincinnati, OH 45268.

Rastatter, C. L., ed. *Municipal Wastewater Management: Citizens Guide to Facility Planning*. FRD-6, Washington, DC: U.S. Environmental Protection Agency, Office of Water Program Operations, January 1979. 263 pp.

A publication prepared by the Conservation Foundation, Washington, DC, provides a selected and extensive discussion of activities pertinent to the responsibilities and work of advisory groups. It includes discussion on public participation. This publication can be obtained from: General Services Administration (8FFS), Centralized Mailing Lists Services, Building 41, Denver Federal Center, Denver, CO 80225.

Rastatter, C. L., ed. *Municipal Wastewater Management: Public Involvement Activities Guide*. FRD-7, Washington, DC: U.S. Environmental Protection Agency, Office of Water Program Operations, February 1979. 125 pp.

This handbook was prepared by the Conservation Foundation for use in a training program to acquaint citizen leaders with the important decisions that are made in planning of wastewater facilities. It condenses the *Citizen's Guide to Facility Planning*. It is available from: General Services Administration (8FFS), Centralized Mailing Lists Services, Building 41, Denver Federal Center, Denver, CO 80225.

Glossary

Advanced Waste Treatment — treatment processes that can increase waste removal beyond the secondary or biological state; it includes removal of nutrients such as phosphorous and nitrogen.

Aerobic Treatment — treatment of wastewater using organisms which are dependent on the presence of oxygen to break down organic matter.

Aquifer — underground bed or layer of earth, gravel, or porous stone that serves as a reservoir for groundwater.

Biochemical Oxygen Demand (BOD) — the amount of dissolved oxygen required in the biological process of breaking down organic matter in water.

Carcinogen — cancer-causing substance.

Chemical Oxygen Demand — a measure of the equivalent amount of oxygen required to break down organic and inorganic compounds in water.

Cost-Effectiveness Analysis — the determination of whether a project or technique is worth funding; it involves both monetary and nonmonetary factors.

Effluent — treated or untreated waste material discharged into the environment.

Environmental Impact Statement (EIS) — a detailed analysis of the potential environmental impacts of a proposed project; it is necessary when advanced waste treatment is required or the EPA determines that a project is highly controversial or may have significant adverse environmental effects.

Gravity Sewer — a collection system which relies on gravity to transport wastewater from homes to a central treatment or disposal facility.

Holding Tank — tank used for storing wastewater prior to treatment, usually used as an alternative for onsite problem areas.

Infiltration-Percolation Land Treatment — the application of treated wastewater onto land to allow it to percolate downward through the soil in order to remove nutrients such as phosphorous and nitrogen.

Infiltration and Inflow (I/I) — leakage of ground and surface water into sewers.

Innovative and Alternative Treatment — a nonconventional, cost or energy-saving system for treating wastewater; it may qualify for an increase in the federal grant share by 10 percent, from 75 to 85 percent.

Mound — a type of onsite disposal system utilizing an absorption field built on a bed of sand.

Nonpoint Source — a non-specific site or location of water pollution such as fertilizer runoff from agricultural lands.

Oxidation Lagoon — a man-made body of water in which wastes are broken down by bacteria.

Permeability — the degree to which a substance is capable of being penetrated by water.

Point Source — a stationary location such as a pipe where pollutants are discharged.

Working for Clean Water is a program designed to help advisory groups improve decision making in water quality planning. It aims at helping people focus on essential issues and questions by providing trained instructors and materials suitable for persons with non-technical backgrounds. These materials include a *citizen handbook* on important principles and considerations about topics in water quality planning, an *audiovisual presentation,* and an *instructor guide* for elaborating points, providing additional information, and engaging in problem-solving exercises.

This program consists of 18 informational units on various aspects of water quality planning:

- Role of Advisory Groups
- Public Participation
- Nonpoint Source Pollution: Agriculture, Forestry, and Mining
- Urban Stormwater Runoff
- Groundwater Contamination
- Facility Planning in the Construction Grants Program
- Municipal Wastewater Processes: Overview
- Municipal Wastewater Processes: Details
- Small Systems
- Innovative and Alternative Technologies
- Industrial Pretreatment
- Land Treatment
- Water Conservation and Reuse
- Multiple Use
- Environmental Assessment
- Cost-Effectiveness Analysis
- Wastewater Facilities Operation and Management
- Financial Management

The units are not designed to make technical experts out of citizens and local officials. Each unit contains essential facts, key questions, advice on how to deal with the issues, and clearly-written technical backgrounds. In short, each unit provides the information that citizen advisors need to better fulfill their role.

This program is available through public participation coordinators at the regional offices of the United States Environmental Protection Agency.□

This information program was financed with federal funds from the U.S. Environmental Protection Agency under Cooperative Agreement No. CT900980 01. The information program has been reviewed by the Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does the mention of trade names or commercial products constitute endorsement of recommendation for use.□

This project is dedicated to the memory of Susan A. Cole.